RESEARCH ARTICLE

Evaluation of Resistance to Leaf Rust in Bread Wheat Landraces and Commercial Cultivars Under Field Conditions and By Using Molecular Markers Linked to *Lr34/Yr18/Sr57* Genes

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ABSTRACT

Sarhangi, M., Zaynali Nezhad, Kh., Börner, A., Nasrollahnezhad Qomi, A., Aghaee Sarbarzeh, M., Dadrezaei, S. T., and Mehrabi, R. 2020. Evaluation of resistance to leaf rust in bread wheat landraces and commercial cultivars under field conditions and by using molecular markers linked to *Lr34/Yr18/Sr57* genes. **Seed and Plant Journal 36:** 255-271 (in Persian).

Leaf rust is one of the most important rusts diseases of wheat in the world, and its potential impact on wheat yield losses has always been considered significant in many regions. Identifying and using resistance genes against fungal diseases in wheat genetic resources is one of the most effective approaches to introduce new sources of resistance to improved commercial wheat cultivars. In this study, 82 bread wheat landraces and commercial cultivars from different parts of the world were evaluated under field conditions and by using molecular markers assay. In the field nursey, 56 genotypes showed susceptible reaction, 22 genotypes were moderately susceptible, and four genotypes showed resistance or immunity to leaf rust. Reactions varied from moderately susceptible to immunity in different genotypes such as genotypes originated from Iran, Nepal, Pakistan, Turkey, and India. Most of these genotypes were landraces which indicates the importance of studying wheat genetic resources. The results of the *Lr34* molecular assay using *csLV34*, *caSNP4* and *caSNP12* markers were identical, and showed the same pattern of resistance allele in six genotypes. In molecular assay, cultivars from Iran with CIMMYT origin and genotypes from India and Turkey had effective alleles of *Lr34* gene. The observed genetic diversity and frequency of genotypes with resistance genes in this study can be useful to enhance germplasm for leaf rust resistance in bread wheat breeding programs in Iran.

Keywords: Genetic diversity, genetic resources, adult plant resistance, moderately susceptible, SNP markers.

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RESEARCH ARTICLE

Effect of Metabolites and Antioxidants on Freezing Tolerance of Lentil Genotypes Under Controlled Conditions

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ABSTRACT

Nabati, J., Nezami, A., Mirmiran, S. M., Hojjat, S. S., and Kafi, M. 2020. Effect of metabolites and antioxidants on freezing tolerance of lentil genotypes under controlled conditions**. Seed and Plant Journal 36:** 273-299 (in Persian).

To study freezing tolerance (-13, -15 and -18°C) of 40 lentil (*Lens culinaris* Medik.) genotypes, a factorial experiment in completely randomized design was carried out at the Research Center of Plant Science, Ferdowsi University of Mashhad, Mashhad, Iran, in 2017-2018. Significant differences observed between genotypes for survival percentage after freezing stress and chlorophyll a, carotenoids, anthocyanins, soluble carbohydrates, proline, malondialdehyde (MDA), phenol, protein, DPPH, ascorbate peroxidase and peroxidase before freezing stress. Stepwise regression analysis showed that chlorophyll b had the most positive effect and protein, and MDA had the most negative effect on survival percentage. Cluster analysis grouped genotypes into five clusters. For most of the studied traits, genotypes in clusters 4 and 5 were greater than average of all genotypes as well as genotypes in other clusters. In clusters 4, anthocyanins, protein, MDA, phenol, proline, ascorbate peroxidase and peroxidase contents were higher than other clusters. Survival percentage, chlorophyll b, carotenoids, total pigments, and DPPH of cluster 5 were higher than the other clusters. Principal component analysis showed that MLC469, MLC458, MLC409, MLC74, MLC84, MLC169, MLC394, MLC95, MLC17, MLC163 and MLC303 for antioxidant capacity and metabolites, and MLC70, MLC410, MLC47, MLC31, MLC91, MLC8, MLC286, MLC407, MLC472, MLC61, MLC83 and MLC334 for photosynthetic pigment capacity were more suitable than the other genotypes. It can be concluded that these attributes are very important in predicting, before cold stress, the effect of cold stress on survival percentage of lentil genotypes.

Keywords: Lentil, pigment, proline, regression model, survival percentage, anthocyanin.

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RESEARCH ARTICLE

Effect of Transplanting Date and Seedling Growth Stage on Some Agronomic Characteristics and Seed Yield of Rapeseed (*Brassica napus* L.) in Kermanshah in Iran

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ABSTRACT

Zareei Siahbidi, A., Jabbari, H., Rezaei Zad, A., and Asgari, A. 2020. Effect of transplanting date and seedling growth stage on some agronomic characteristics and seed yield of rapeseed (*Brassica napus* L.) in Kermanshah in Iran. **Seed and Plant Journal 36:** 301-315 (in Persian).

The present study was conducted to investigate oilseed rape transplanting at Islamabad Gharb research station, Islamabad, Iran, in 2017-2019 cropping seasons. A factorial experiment in randomized complete block design with three replications was carried out. Experimental treatments consisted of three transplanting dates; 17th October, 1st November and 16st November, and two seedling growth stages; two and four-leaf stages. The results revealed that transplanting date had significant effect on some traits such as seed yield, seed no. silique^{-1}, silique no. plant^{-1}, plant height, seed oil content and days to flowering. The seedling growth stage had significant effect on seed no. silique^{-1}, silique no. plant^{-1} and seed yield. The results also showed that transplanting at four-leaf stage was better than two-leaf stage as the seed yield in this stage (2773 kg ha^{-1}) was greater than two-leaf stage (2157 kg ha^{-1}). Transplanting on October 17 produced more seed yield (3158 kg ha^{-1}) than November 01 and November 16 with 2403 kg ha^{-1} and 1834 kg ha^{-1}, respectively. Considering the results of this research, transplanting of rapeseed can be recommended for delayed planting, at 4-leaf stage and transplanting date on 17 October, in Kermanshah and similar environmental conditions in Iran.

Keywords: Rapeseed, transplanting method, silique no. plant^{-1}, yield components, oil content.

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RESEARCH ARTICLE

Evaluation of Salinity Tolerance in Six Olive (*Olea europaea* L.) Genotypes in Controlled Environment

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ABSTRACT

Zeinanloo, A. A., Dodangeh, M., and Tavoosi, S. M. 2020. Evaluation of salinity tolerance in six olive (*Olea europaea* L.) genotypes in controlled environment**. Seed and Plant Journal 36:** 317-333 (in Persian).

Limitation of water resources and salinity of water and soil are important factors in the development of olive cultivation and production. Therefore, it is very important to select and introduce salinity tolerant olive cultivars. This study was carried out using six olive cultivars and promising genotypes (Conservolia, Koroneiki, Amin, D1, Ds8 and Ozineh2) and three salinity treatment (0, 50, 200 mMl^{-1} NaCl) as factorial experiment in completely randomized design with three replications in controlled environment. The results showed that with increasing salinity, the Na^+ content increased in roots, stems and leaves tissues. The concentration of Na^+, Cl^- and K^+ in these tissues was affected by salinity levels and olive genotypes. As the salt concentration increased, the potassium content and K^+/Na^+ ratio significantly decreased in roots, stems and leaves tissues. Transfer of Cl^- from root to stem and leaves in susceptible cultivars and genotypes was higher than in tolerant genotypes. Cultivar Conservolia and genotypes and D1 genotype had the lowest leaf area. Salt injury index of showed that cv. Amin and Ds8 genotype had no injury symptom. However cv. Conservolia and D1 genotype showed the greatest injury symptoms by salinity stress. According to the results of this research, cv. Amin and Ds8 genotype were identified as tolerant, Ozineh2 promising genotype relatively susceptible, cv. Koroneiki as susceptible, and cv. Conservolia and D1 genotype as very susceptible to salt stress.

Key words: Olive, leaf area, K^+/Na^+ ratio, sodium chloride, salt tolerance index.

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RESEARCH ARTICLE

Response of Seed and Oil Yield of Safflower (*Carthamus tinctorius* L.) Cultivars to Saline Irrigation Water in Sistan Region in Iran

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ABSTRACT

Fanaei, H. R., and Omidi Tabrizi, A. H. 2020. Response of seed and oil yield of safflower (*carthamus tinctorius* l.) cultivars to saline irrigation water in Sistan region in Iran. **Seed and Plant Journal 36 (1):** 335-356 (in Persian).

To evaluate response of seed yield, oil content and oil yield of eight safflower (*Carthamus tinctorius* L.) cultivars; Goldashat, Parnian, Padideh, Golmehr, Sofeh, Mexico 6, Faraman and Mexico 13 to saline irrigation water (5.5-6.0 ds m^{-1}) using randomized complete block design with three replications in Zahak agricultural research station, Iran, in 2014 and 2015 cropping seasons. Combined analysis of variance showed that there was significant ($P < 0.01$) differences between safflower cultivars for all traits. The highest seed yield belonged to cv. Goldashat, cv. Parnian and Faraman with mean of 2753, 2407 and 2326 kg ha^{-1}, respectively. The highest oil content belonged to cv. Faraman and cv. Mexico 13, respectively. The seeds no. $head^{-1}$ (r = 0.64**), 1000 seed weight (r = 0.60**), and oil yield (r = 0.91**) had strong significant positive correlation with seed yield. Goldasht had the highest seed no. $head^{-1}$, 1000 seeds weight and highest seed yield in comparison with other cultivars. Therefore, cv. Goldasht was identified as a suitable safflower cultivar for being grown under saline irrigation water conditions in Sistan region.

Key words: Safflower, saline water, seed oil content, seed no. $head^{-1}$, 1000 seed weight.

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RESEARCH ARTICLE

Effect of Irrigation Regime and Phosphorus Fertilizer on Growth Characteristics and Seed Yield and Forage Yield of Two Grasspea (*Lathyrus sativus* L.) Ecotypes

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ABSTRACT

Bahramnejad, A., Heydari Sharifabad, H. and Madani, H. 2020. Effect of irrigation regime and phosphorus fertilizer on growth characteristics and seed yield and forage yield of two grasspea (*Lathyrus sativus* L.) ecotypes. **Seed and Plant 36:** 357-375 (in Persian).

Grasspea (*Lathyrus sativus* L.) is a forgotten plant and its cultivation is important in the scope of sustainable crop production. In a field experiment, using split factorial arrangements in randomized complete block design with three replications, the effects of irrigation regimes; 50, 75 and 100% of evaporation of class A evaporation pan, and different rates of phosphorous fertilizer (triple superphosphate); 0, 60 and 120 kg ha^{-1} on growth characteristics, seed yield and forage yield of two grasspea ecotypes; Lalehzar and Sharekord, in Lalehzar region in Kerman province, Iran, in 2018 and 2019 growing seasons was studied. The results showed that drought stress significantly reduced pod no. m^{-2}, plant height, seed yield and biological yield. Application of phosphorous fertilizer increased grasspea growth and yield. Overall, Shahrekord ecotype showed higher seed yield (2401 kg ha^{-1}) and biological yield (5612 kg ha^{-1}). The highest phosphorus productivity (39.98 kg seed kg P^{-1}) achieved in 75% of evaporation irrigation regime plus 60 kg ha^{-1} triple superphosphate fertilizer. Therefore, growing Shahrekord grasspea ecotype in Lalehzar region would be reasonable in terms of saving water and managing the application of phosphorous fertilizer.

Keywords: Grasspea, ecotype, Lalehzar, seed yield, phosphorus productivity, yield components.

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RESEARCH SHORT ARTICLE

Screening of Desi Type Chickpea Accessions Collection of the National Plant Gene Bank of Iran for Cold Tolerance Under Field Conditions

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ABSTRACT

Pouresmael, M., Sadeghzadeh Ahari, D., Kanouni, H., Bokaei, A. S., and Mahdieh, M. 2020. Screening of desi type chickpea accessions collection of the National Plant Gene Bank of Iran for cold tolerance under field conditions**. Seed and Plant 36: 377-382 (in Persian).**

Cold stress is one of the main limiting factors for autumn planting of chickpea. The probability of presence of cold tolerant genes is considered to be higher in accessions originating from cold and highlands areas due to natural selection process. With this purpose, 812 Desi chickpea accessions of the National Plant Gene Bank of Iran (NPGBI) originated from cold and high altitude regions (altitude more than 1200 m) were screened for cold tolerance. The experiment was set up as augmented design and carried out in dryland agricultural research station in Maragheh, Iran, in 2018-19 cropping season. The reaction of these accessions to the natural cold temperatures in the region was investigated in comparison to tolerant cultivars (Saeed and Saral), and susceptible line (ILC533). Accessions were scored based on the percentage of frost resistance ratio (FRR). Considerable variation was observed among accessions, while the average FRR was estimated 30% and 50% in Saeed and Saral cultivars, respectively, and ILC533 was completely killed by frost. Frost resistance ratio ranged between 0 and 70 percent in NPGBI Desi chickpea accessions. In total, 114 accessions could survive natural cold temperatures and completed their life cycle. The accessions number KC215724, KC215443, KC215712, KC215905, KC215911, KC216223, KC215458, KC215468 and KC215856 showed 60% FRR, and accession number KC215724 obtained 70% FRR, and were more cold tolerant than the other accessions. Therefore, these accessions can be used for being selected and released as new cold tolerant cultivars as well as in chickpea breeding programs for target environments.

Key words: Desi chickpea, cold stress, landraces, dryland, autumn chickpea.

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